SDMS US EPA REGION V -1

SOME IMAGES WITHIN THIS DOCUMENT MAY BE ILLEGIBLE DUE TO BAD SOURCE DOCUMENTS.

155028

[illegible]

[illegible]

[illegible] November [illegible] 1988 [illegible]

[illegible] [illegible]

[illegible] May 1988 EHE Report

TO [illegible]

Attached for you review and comment is the revised draft of the Monsanto comments on the May 1988 Report on the Sauget Sites by USEPA and Dailey and Environment, Inc. This draft incorporates your previous comments in the original draft. Please return any comments on this draft to me by November 10, 1988.

USEPA has not yet announced the public comment period that they noted during their May 1988 presentation of the report. By copy of this memo I am requesting Max McCombs to contact USEPA and determine when and if such a public comment period is planned. Unless such a public comment period is imminent, we should plan to have our comments on this draft December 2 to the agency for the record and also have copies available to interested PRPs.

W. L. Hall

CER 068191

C O M M E N T S

S U B M I T T E D B Y

M O N S A N T O C O M P A N Y

O N T H E

EXPANDED SITE INVESTIGATION

DEAD CREEK PROJECT SITES

AT CAHOKIA/SAUGET, ILLINOIS

FINAL REPORT

MAY 1988

Prepared For: ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

Prepared By: ECOLOGY AND ENVIRONMENT, INC.

NOVEMBER 1988

CER 068192

COMMENTS ON THE EXPANDED SITE INVESTIGATION

DEAD CREEK PROJECT SITES

AT CAHOKIA/SAUGET, ILLINOIS

FINAL REPORT

MAY 1988

The investigation has not fulfilled the specific goals that were set forth on page 1-2 of the subject report. In general, the study has located and defined to a greater or lesser extent (depending upon the site) the types and approximate quantities of waste materials present but it has not provided "a comprehensive catalog of wastes present at the various project sites" because of cursory studies at some sites. It has demonstrated that releases occur to the environment in certain locations, such as the ground-water discharge to the Mississippi River from Site R (Monsanto Landfill) and a possible dust problem at Site G. Because of a lack of sufficient data however, the report has not adequately assessed the pathways by which contaminants could be

released into the environment from most sites and has not adequately assessed the expected movements of contaminants in the various media (air, groundwater, etc.) at all the sites. As a basis for HRS scoring, the study is inadequate because there are some critical data insufficiencies and technical flaws.

Additionally we are concerned about indications of inadequate QA/QC procedures which clouds the validity of the data presented and numerous conclusions of the report that appear speculative in nature as they are unsupported by the technical data presented.

In the following sections we have expanded on the general comments made above and have provided illustrative examples of problems and inadequacies in the report. For convenience, we have organized our comments according to chapter beginning with Chapter 7 which presents the conclusions of the report.

CHAPTER 7 - CONCLUSIONS AND FINDINGS

1. The first finding implies that Monsanto is responsible for much of the waste in several sites because many compounds from Monsanto processes found in Site R (for which Monsanto was primarily responsible) were also found in other sites. While there

are compounds in common benzene, chlorobenzene, and phenols, for example) the source and/or route by which these compounds came to be in some locations is unknown and will probably never be known. In addition, several other compounds are also present which implicates other sources. For instance, toluene, ethylbenzene, xylene and chlorinated volatile organic compounds (VOC) were found in subsurface soils at Site G and polyaromatic hydrocarbons (PAH) were found at Site O. The presence of benzene, toluene, ethylbenzene and xylene (BTEX) could be the result of fuel (gasoline) contamination and the PAH are likely associated with a former refinery operation in the area. It should also be noted that virtually every industry in the Sauget area, including several trucking firms which washed tank trailers at their sites after hauling materials from outside the Sauget area, contributed to contamination at Site O where the sludge from the Sauget POTW was deposited.

2. The report states on page 7-4 that waste from the Sauget POTW and flow of contaminated leachate to the Mississippi River has lead to "a general degradation of water quality in the river and has contaminated fish in the river." As support for this conclusion, the report cites a U. S. Food and Drug Administration (USFDA) study indicating the presence of contaminants from the DCP (Dead Creek Project) area in fish collected 100 miles downstream. The study presents no data on the impact of the

Sauget POTW, surface runoff from the DCP area, or groundwater discharge from the DCP area to the river. Thus the statement in the report must be considered speculative at best. The fish study conducted by the USFDA presents no data on the impact of the DCP area or any other possible sources on the findings of their study.

3. In making reference to Site K on page 7-5, the report implies that the presence of a dark liquid or dark staining (as interpreted from a photograph) is indicative of contamination. Unless the IEPA has analytical results or other scientific evidence to indicate that this material is waste or hazardous, this conclusion should be deleted from the report because it is speculative and unjustified.

4. On page 7-7 the report provides several conclusions regarding drinking water supplies. These conclusions are critical to HRS scoring because contaminated drinking water supplies weigh heavily in the score. There is no evidence in the report that indicates that drinking water supplies in the DCP area are contaminated. The public drinking water supply originates from a surface water intake in the Mississippi River about 3 miles upstream from the DCP area. Because this intake is upstream there is no possibility that contaminants from the site could enter this system.

If the 50 wells mentioned on page 7-7 of the report, none appear to be downgradient from DCP areas where contaminants were found. The closest wells are along Judith Lane and are listed as GW-52 through GW-55 on Figure 3-15. All of the low level volatile organics found in these wells were either in the blanks or were below method detections limits. None of these wells can be regarded as being contaminated. If, however, the IEPA is concerned about the use of these wells for potable supplies, it is suggested that IEPA prohibit the homeowners from using these wells for potable purposes.

The nearest downstream potable public supply is stated as being located approximately 28 miles south of the DCP area at the Village of Crystal City, Missouri. Crystal City apparently relies on a Ranney Collector adjacent to the river as a source of potable water. A Ranney Collector is not technically a surface water intake because it pumps ground water, although it does rely on induced infiltration from the river. The well is significantly more than three miles (the zone considered for HRS scoring) from the DCP area and any contaminants entering the river from the DCP sites would probably not be detectable at this point in the river. The quality of water in the Ranney Collector is the sum of all upstream sources, not just the DCP site's potential contribution, and without being able to differentiate the DCP source from other sources, the IEPA cannot estimate the impact

of a potential area of the Ramney Collector. The Ramney Collector is simply too remote from the DCP site to be a factor in HRS scoring. If the IEPA has a concern about the Ramney Collector water quality, it would seem prudent for them to sample same.

The nearest downstream surface water intake is at river mile 110, a remote 65 miles south of the DCP area. This supply is significantly more than three miles from the DCP area and any potential contaminants that might originate from the DCP area would probably not be detectable at this point in the river. This intake is too remote to be considered in the HRS scoring.

5. Page 7-37 of the report again refers to private wells and indicates that concentrations of toluene, ethylbenzene, carbon disulfide and styrene were found in private wells. The table in Appendix D, however, shows that these compounds were found <u>below</u> method detections limits which indicates that concentrations are so low that they cannot be quantified. In addition, only one sample from each well was collected and the analytical results have not been confirmed. Without confirmation of higher, detectable levels, the IEPA cannot conclude that the private wells are contaminated. Any perceived risk on the part of IEPA may best be addressed by resampling the wells with extensive QA/QC support.

6. E & E states on page 7-3 (and also on page 4-103) that the contamination detected in the Clayton Chemical Company well (GW-39) indicates that the contamination originating at Site O is being transported off-site and contaminating groundwater used by the public. The Clayton well is about 70 feet deep and pumps approximately 700,000 to 1,000,000 gallons per month (16 to 23 gpm) on an intermittent basis for process water. E & E used the designation "gpm" which is commonly used to indicate gallons per minute, not gallons per month. This designation gives a false impression as to the volume of water that is actually being pumped each month.

This well taps the intermediate zone and any contaminations in it may not have originated from the shallow zone in Site O, as concluded by E & E, but from another source to the east. Many compounds were found in large concentrations in well EE-22 (sample GW-39); however, only two compounds were found above 50 ug/L in the Clayton well and none were found above 50 ug/L in the new wells installed between Site R and Site O. Therefore, the "fingerprint" compounds found at Site O do not correlate well with the compounds found in the Clayton well.

7. The analysis of air samples at Sites Q and R are discussed

in page 7-38. The report indicates that polychlorinated biphenyls (PCBs) were found in three samples from locations DC-19, DC-20 and DC-26; however, the levels that were found are extremely low and the report does not make clear whether or not these results are for filtered air samples or whether they were as a result of analysis of particulate matter. The values that are given are in the parts per trillion range and the report does not indicate the confidence level of the data. The accuracy and precision of these analyses would be needed to establish what, if any, level of confidence can be ascribed to these data.

In addition to the potential problems regarding accuracy and precision, it is not clear what these analytical results mean because the sampling technique appears to be flawed. The report does not specify, for example, which stations are upwind and which stations are downwind of Sites Q and R. For example, Figure 4-53 indicates that the wind was predominantly from the southeast during sampling on July 22. The nearest potential upwind stations are in the vicinity of Site G where PCBs were identified at several stations. If PCBs were found upwind at Site G, the PCBs at stations DC-19, DC-20 and DC-26 cannot be attributed to Site Q (see page 4-173).

Also on page 4-173 the report concludes that Site R could

on page 7-38. The report indicates that polychlorinated biphenyls (PCBs) were found in three samples from locations DC-19, DC-20 and DC-26; however, the levels that were found are extremely low and the report does not make clear whether or not these results are for filtered air samples or whether they were as a result of analysis of particulate matter. The values that are given are in the parts per trillion range and the report does not indicate the confidence level of the data. The accuracy and precision of these analyses would be needed to establish what, if any, level of confidence can be ascribed to these data.

In addition to the potential problems regarding accuracy and precision, it is not clear what these analytical results mean because the sampling technique appears to be flawed. The report does not specify, for example, which stations are upwind and which stations are downwind of Sites Q and R. For example, Figure 4-53 indicates that the wind was predominantly from the southeast during sampling on July 22. The nearest potential upwind stations are in the vicinity of Site G where PCBs were identified at several stations. If PCBs were found upwind at Site G, the PCBs at stations DC-19, DC-20 and DC-26 cannot be attributed to Site Q (see page 4-173).

Also on page 4-173 the report concludes that Site R could

potentially be a supplemental contributor of PCBs and phenols detected at Site C. C. It should be noted that Site F is capped with a low permeability material (permeability 5 x 10⁻⁷ cm/sec) which ranges in thickness from 2 to 10 feet. It is virtually impossible for PCBs and phenols to leave Site B because the most likely mode of transport it via the mobilization of particulate matter which is prevented by the cap. In addition, phenol was detected only once (DC-20) at a low concentration (0.04 ug/m³), and at an estimated value (J indicator) below the specified detection limit. This sample was collected during the first day of sampling when the wind direction was highly variable, according to E & E (page 4-173).

Matrix spikes are referred to on page 3-53; however, no data are provided or discussed. Only 12 low-volume samples are listed in Table 3-7 (page 3-55) as compared to 14 high-volume samples and there should be an equal number of samples.

The reproducibility between sample DC-01 and its replicate (DC-06 is not good (Table 4-26 on page 4-166). Eight compounds were detected in DC-06 that were not found in DC-01. There should be an explanation as to why these compounds were detected in one sample and not in the other. Also, isophorone was detected in sample DC-05 and it was indicated as being found in the blank (B

designator); however, isophorone is not listed in the blank samples DC-07 and DC-14) from Table 4-26. In addition, the J designator was not used for isophorone in sample DC-07 to indicate that it was found in the blank sample.

Sample DC-27 does not have high-volume data due to equipment failure; however, the low volume data should be available. In Table 4-27 (page 4-171), E & E reports the results for DC-27 as not analyzed and not detected for the compounds listed with no explanation given as to the reason for same.

Overall the air sampling program is not comprehensive and inadequate for determining whether releases to the environment have occurred. IEPA has ignored the fact that the Sauget area is a highly industrialized community with numerous potential sources of contaminants to the air. Attempts to attribute contaminants to a particular source require a very comprehensive and sophisticated sampling approach over a long period of time. This has not been done.

8. The analysis of air samples at Sites Q and R are discussed on page 7-38. The report indicates that PCBs were found in three samples from locations DC-19, DC-20 and DC-26; however, the levels that were found are extremely low and the report does not

make clear whether or not these results are for filtered air samples or whether they were as a result of analyses of particulate matter. The values that are given are in the parts per trillion range and the report does not indicate the confidence level of the data. In order to determine how accurate and precise these values are, the IEPA should provide values of accuracy and precision to determine how much confidence, if any, can be attributed to these results.

In addition to the potential problems regarding accuracy and precision, it is not clear what these analytical results mean because the sampling technique appears to be flawed. The report does not specify, for example, which stations are upwind and which stations are downwind of Sites Q and R. Specifically, Figure 4-53 indicates that the wind was predominantly from the southeast during sampling on July 22. The nearest potential upwind stations are in the vicinity of Site G where PCBs were identified at several stations. If PCBs were found upwind at Site G, the PCBs at stations DC-19, DC-20 and DC-26 cannot be attributed to Site G (See page 4-173).

Also of page 4-173 the report concludes that Site R could potentially be a supplemental contributor of PCBs and phenols. It should be noted that Site R is capped with a low permeability

material (permeability 5 x 10⁻⁷ cm/sec) which ranges in thickness from 2 to 10 feet. It is virtually impossible for PCBs and phenols to leave Site F via the air pathway because the most likely mode of transport is via the mobilization of particulate matter which is prevented by the cap.

Overall, the air sampling program is not comprehensive and is inadequate for determining whether releases to the environment have occurred. The IEPA has ignored the fact that the Sauget area is a highly industrialized community with numerous potential sources of contaminants to the air. Attempts to attribute a particular source require a very comprehensive and sophisticated sampling approach over a long period of time. This has not been done.

3. Estimated loading of organics to the Mississippi River from Areas 1 and 2 is discussed on page 7-39. We could not understand the 130 pound per day figure and requested that Geraghty & Miller contact E & E to determine the basis for the calculation. Following that contact Geraghty & Miller reported that in their report, Plant-Wide Assessment of Ground-Water Conditions at the W. G. Krummrich Plant, dated September 1986, they determined that 87 lbs./day of organic compounds discharged to the Mississippi River assuming that the gradient is westward

CER 068204

all the time; however, this rate was reduced to 57 lbs./day because discharge to the river is blocked by high river stage 12 percent of the time. Geraghty & Miller had based their calculations on the sum of the discharges from the shallow, intermediate, and deep zones of the aquifer.

If the total discharge, Geraghty and Miller determined 57 lbs./day was contributed by the deep zone. In preparing their calculations, Geraghty & Miller used the chemical concentrations from wells GM-27B, GM-27C, GM-28B and GM-28C which are screened in the deep zone or at the boundary between the deep and intermediate zones. The constituent concentrations from both zones were averaged because concentrations in each zone are similar.

In contrast, E & E chose to use only the chemical results from wells GM-27C and GM-28C to determine the deep zone loading to the river. These recalculations resulted in an average loading rate of 22 lbs./day, as shown on page 5-27 of the May 1988 report. In making these calculations, E & E assumed that the hydraulic gradients in the shallow and intermediate zones also apply to the deep zone, an assumption that is incorrect. E & E stated that; "It did not want to spend the extra time required to calculate the deep zone gradients," and E & E agreed that this

procedure was open to argument.

Another concern with the report is that the 100 lbs./day figure conflicts with information in table 5-4 (page 5-11). Only 40.67 lbs./day are being discharged to the river assuming a maximum hydraulic gradient according to Table 5-4. E & E advised Geraghty & Miller that they could not explain this discrepancy without authorization from IEPA. Geraghty & Miller requested a copy of the water-level data used by E & E to determine the ratio between the minimum and maximum hydraulic gradients, but has not received them as of this writing.

The hydraulic gradient that is used to determine the ground-water discharge rate is the slope of the water table toward the Mississippi River. The gradient is determined by measuring the elevation of water levels in monitoring wells. Geraghty & Miller has collected water-level data from Monsanto's monitoring well network semiannually during the spring and fall of each year since their September 1986 report was prepared. Prior to that time, measurements were made at various times of the year. In addition, water-level recorders have been recording data continuously at the landfill since September 1984. When Geraghty & Miller prepared their loading calculation in 1986, they used the August 1984 water-level data because the river level

was low and the hydraulic gradient to the river was the greatest they had been able to measure. In effect, Geraghty and Miller determined the worst case scenario based on available data.

E & E believes that the hydraulic gradient of the deep zone is six times greater during the maximum loading period when compared to the minimum loading period. For this to be possible, water levels would have to be approximately 10 to 12 feet higher in deep wells upgradient of the landfill with no change in water levels downgradient of the landfill. Based on Geraghty & Millers' knowledge of the site and the historical water data collected over the past 5 years; they believe that this situation would never occur.

Another assumption which E & E made with regard to contaminant loading to the river appears not to be technically correct. In their report E & E estimated that about 20% of the loading from Site R is due to a contribution from Site O (page 5-27). In July 1988, we installed a cluster of three wells between these two sites to monitor ground-water quality in the shallow, intermediate and deep zones of the aquifer. In addition, two shallow wells were installed downgradient (in the southern portion) of the lagoon area to supplement the existing monitoring network. Preliminary water-quality data for these wells indicate that total

priority pollutant compounds plus nonpriority pollutants were detected in the shallow, intermediate and deep zones at only 70, 150 and 25 ug/L.

Even if it is assumed that the total organic concentration of 500,000 ug/L found in well EE-22 is representative of the entire site (which it is not) and that no attenuation occurs between Site C and the river, the potential discharge from the shallow zone at Site C would be only 1.5 lbs. per day. This is only about two percent of the total loading in the vicinity of Site B.

Geraghty & Miller's 1986 report indicates that constituents in the intermediate and deep zones at Site C logically do not originate at Site C because there is no vertical gradient which could cause vertical migration. The constituents in the intermediate and deep zones probably originate in a source to the east of Site C and, therefore, cannot be attributed to Site C.

10. E & E indicates on page 7-41 that the agencies have information of past discharges of process water and waste by Monsanto to Dead Creek, but does not document this information. E & E concludes that staining (discoloration?) in the northern section of Dead Creed (CS-A) is visible on aerial photographs and this staining resulted at least in part from direct discharge of

waste materials from Monsanto. Monsanto did not "discharge process waste to Dead Creek" and the air photo "evidence" E & E cites is clearly insufficient to support the claims made on page 7-41. Only chemical analyses of soils or other site specific information will confirm whether or not the "staining" seen in the air photo is contaminated material.

11. Contaminant migration and fate is discussed on page 7-39. The analysis of contaminant fate is oversimplified and technically incorrect because of basic flaws in the modeling approach that was taken.

The main problem with the flow model is that the shallow and intermediate zones were modeled separately. The report indicates that two separate models were constructed, but by assuming that a "uniform vertical gradient " the model is essentially three-dimensional. A uniform vertical gradient implies an effect equivalent to a recharge rate. That is, the inter-layer flux would be calculated by multiplying the vertical permeability by the "uniform gradient". If this was done, the report should specify what value was used for the "uniform gradient". It appears, however, that the two models are totally separate and no flow was calculated between layers. This is unrealistic given the hydrogeologic conditions at the site.

The deep zone of the aquifer system in the Jauget area is the dominant flow zone due to its high permeability. This was not included in the model, probably because there are very few deep wells in the area.

Recharge was neglected by stating that it was neglible. The report should provide a sensitivity analysis or a mass balance analysis to support this assumption. Assuming a gradient of 0.0011 ft/ft, K = 6.5 ft/da (948.7 gpd/ft^2), saturated thickness of 30 feet and the length of the eastern boundary (3500 ft), the total influx through the eastern boundary in the shallow zone of the E & E model is (Q=KAI), about 1800 ft^3/da. This is 65 times greater than the influx through the eastern boundary. In fact, it would only require about 0.008 ft/yr of recharge to balance the eastern flux. From this simple mass balance calculation, we conclude that recharge cannot be ignored. Ritchey et al. (1984) also concludes that recharge cannot be neglected.

The report does not show or cite the regional water-level map used to estimate the eastern boundary condition. No cross-sections are provided to justify the layer bottom elevations.

The model assumes that vertical permeability equals horizontal

permeability when calculating the flux of contaminants from the shallow zone to the intermediate zone. This is seldom justifiable for glacio-fluvial aquifer systems such as that of the Cauget area. Typically, the ratio of horizontal to vertical permeability is 10 to 1 or 100 to 1. Thus, the mass of contaminants moving into the intermediate zone was greatly exaggerated.

Details of loading calculations were not given, however, they appear to be based on steady-state or average flow conditions (Page 5-22). If this approach was used, then a transport model is unnecessary.

The modeling concept is also flawed because the finite difference mesh contains far too few nodes (462) for this type of analysis. At least three times this number should have been used. More detailed analysis of residual statistics should be given to justify the flow model calibration results. This would include calculation of the residual mean, residual standard deviation, and the standard errors associated with the transmissivity and storage estimates.

12. On page 7-43 the IEPA indicates that the average total organic contaminant concentration at Site G is 4,406 mg/kg (milligrams per kilogram) which is calculated from three subsurface

samples (G5-37, G7-63 and G8-70). This estimate is likely to be biased because three samples are not representative of the contamination in Site G. An average concentration requires data from a representative number of grid points. The report does not indicate how the sampling points were chosen as representative of the site.

13. On page 7-45 the report concludes (presumably based on modeling results) that contaminants are migrating vertically at Sites G, H and I. This conclusion is unwarranted because no wells were installed in the intermediate zone and the vertical hydraulic gradient was not measured. Modeling results without field evidence of a driving force to transport contaminants from the shallow zone to the intermediate zone are not reliable. In fact, Geraghty & Miller has already demonstrated that the vertical gradient at Site O and at the Route 3 Drum Site is slight or nonexistent and we expect similar vertical gradients at Sites G, H and I.

14. The report concludes on page 7-46 that the present distribution of contamination in Area 1 wells indicates that historical pumpage has influenced the distribution of contaminants. This conclusion is unsupported because it is based upon data from very few wells, all of which are drilled in the shallow zone.

In order to determine whether or not historical pumpage has had an impact on the distribution of contaminants, the IEPA and E & E would have had to drill a much larger number of wells in the shallow zone as well as in the intermediate and deep zones.

While there was a general pumping center identified in the Sauget area, individual wells generate individual areas of influence and without being able to reconstruct these zones of influence, the report cannot attribute the occurrence of contaminants to pumpage patterns. The level of detail obtained by IEPA in this study is not adequate to draw the conclusion that pumpage is responsible for contaminant distributions.

15. On page 7-47, the IEPA indicates that contaminants originating from Area 1 sites would be preferentially transported to the intermediate zone and would reach the Mississippi River in approximately 20 years. This conclusion is unsupported based on the modeling exercises that were undertaken (See number 8 above). As we have indicated the modeling studies were over simplified, technically incorrect and the models were not calibrated.

16. In discussing Area 2, the report (Page 7-48) indicates that there is a common generator for the various wastes in the DCP area. As we have already indicated in item 1 above, this

conclusion is incorrect. The very presence of PAHs and metals, for example, indicates more than one generator is responsible for the wastes. Simply stated Monsanto is not responsible for all of the contamination in Area C.

17. Also on page 7-48 the report concludes that the likelihood of a common generator and the presence of common pathways supports aggregating Sites C, Q and R for HRS scoring purposes. In fact, there are many reasons why the sites should not be aggregated. The current site condition, the known history of waste deposition, the relationship of wastes to the water table and the fact that there is more than one generator of the wastes indicate that each site should be considered separately.

Both Sites C and R are already covered and therefore do not represent sources of contamination to the air because particulate matter and volatile organic compounds cannot escape. This is not true of Site Q which has only been partially or inadequately covered. By aggregating sites, the HRS score would be biased by assuming that Sites C and R are sources of contaminants in the air which is clearly not correct.

The Geraghty & Miller report indicates that wastes at Site R are below the water table whereas the waste in Site C is above the

water table. Because of the different relationship of the waste to the water table at each site, the impact of Site Q on the ground water system is different than that of Site R. There is evidence that contaminants have not migrated away from Site Q in any significant concentrations whereas there is evidence of ground water contamination at Site R. The very low vertical gradients at well clusters in the vicinity of Site Q indicate that vertical migration is not occurring and contaminants will remain confined to the shallow zone where contaminant transport is very slow.

The groundwater studies in Site Q cannot be regarded as representative of groundwater conditions at that site. The site is 90 acres in area and only six wells were installed. Without additional wells, the groundwater quality data base that has been generated for this site are insufficient to support HRS scoring. The wells that were installed may simply have intersected areas where concentrations of contaminants similar to those in Site R were found. Likewise, the boring program conducted by the IEPA in the part of Site Q east of Site R cannot be considered representative of the whole site. Given the history of the site, which indicates haphazard disposal, additional wells and borings might be expected to yield data leading to a different conclusion regarding the average concentration of contaminants and the

origin of same. In addition, with the existing well system groundwater discharges to the river cannot be evaluated. Along with the other reasons given above, Site Q should not be combined with Sites O and P because it is not well understood.

CHAPTER 2 - SITE BACKGROUND

18. On page 2-38 the report discusses the locations of private wells and indicates that at least 50 area residents have wells which are used for drinking water or irrigation. Using "extent and severity of contamination" as the reason for extending the assessment beyond the three mile radius required for HRS scoring is simply not justifiable, particularly when the target areas are not downgradient of the site. There must be a substantial risk that contaminants will extend beyond the three mile radius to justify expanding the study area in any direction, and in no case side gradient or up gradient. It would have been helpful for the IEPA to provide a map showing the three mile radius around the site in order to determine which private wells are in fact included in the study area.

The reason given for expanding the assessment beyond the three mile radius is not technically supportable. It suggests that it is

IEPA's goal to expand the data base to influence NPL listing rather than to evaluate the actual environmental impact of the DCP sites. The IEPA's goal of placing these sites on the NPL is explicitly demonstrated in page 3-40 where the report says that air sampling was conducted "in order to increase the possibility of qualifying sites for inclusion on the "USEPA NPL". Here again, the IEPA has conducted studies for NPL listing purposes rather than to assess environmental impact at the DCP sites.

13. The IEPA states that the degradation in ground-water quality in the area is "one likely reason" for the cessation of ground water pumping, but then notes that substantiating documentation of that statement has not been located. A more logical reason why groundwater pumping declined was because "once through" process systems became uneconomical as a result of increasingly more stringent waste water discharge requirements. As industry switched to recycling water, the demand for water decreased dramatically. For example, wastewater flow to the Sauget POTW decreased from 35.7 MGD in 1970, the first year for which accurate flow records exist, to 9.6 MGD in 1977 and to 7.7 MGD in 1987.

CHAPTER 3 - EXPANDED SITE INVESTIGATION PROCEDURES

20. The well construction techniques are described on page 3-25. The paragraph at the top of the page indicates that the annulus was filled with a grout after the bentonite seal had been placed around the well casing. This statement is not entirely accurate. In at least one case, an observer from Geraghty & Miller saw drilling cuttings (possibly contaminated) being kicked back into the annulus of a well at the same time the grout was being added. For more detail, please refer to the SCDRA letter of September 21, 1987, a copy of which is appended.

CHAPTER 5 - GROUNDWATER TRANSPORT MODELING

21. Figure 5-4 and this paragraph of the report appear to indicate that the general groundwater flow towards the river is reversed during the months of March, April, May and November. This is not correct. River stage is related more to rainfall in the upper reaches of the Mississippi River basin rather than to events in the vicinity of Sauget, which means that flow reversals can occur at any time. Flow reversals must be analyzed on a probability basis in a fashion similar to estimating frequency of occurrence of various river stages.

Geraghty & Miller's report dated September 1980 has indicated that the flow is reversed approximately 10 percent of the time which is based on an examination of hydrographs from Monsanto's monitoring wells and the entire historical record kept by the Corps of Engineers for river stages in the Mississippi River. The E & E estimates of contaminant loading to the Mississippi River are inaccurate because they are based on computer generated discharges calculated by the model which, in turn, are based on Figure 5-4.

22. On page 5-26 of the report, an incorrect method has been used for calculating loading to the river from Area 1 sites. The equation m = Q x Caverage is used, where m is the mass, Q is the flow and Caverage is the average concentration at the site. It appears that the report is attempting to apply the conservation of mass principle; that is the mass leaving the site will eventually discharge to the river. In this case, the principle has been incorrectly applied because it does not take into consideration processes such as adsorption, biodegradation and hydrodynamic dispersion, which attenuate concentrations. These calculations, along with the flawed flow estimates, have resulted in an overestimate of contaminants discharging to the river.

23. Table 6-19 (On page 6-42) is a summary of the contaminant transport pathway and exposure route assessment. Site R should be eliminated from the first column under "runoff". Contaminated runoff cannot be a problem because the site is capped. In addition Site O should be eliminated from the "dust/volatilized emission" category under "potential pathways" because the site has been covered and there is virtually no possibility that dust or volatile organic compounds are escaping.

We have already discussed the problems associated with the modeling which has led to incorrect estimates of loading to the Mississippi River. Many other sites such as G, H and I, which are remote from the river are probably not contributing to contamination in the Mississippi River and should be shifted to the column representing potential pathways.

MISCELLANEOUS

24. Page R-25 in the Appendices states that the Geraghty & Miller, Inc. data for Site R has not been made available. This statement indicates that much of this section is outdated and in

need of review because the IEPA has been in the possession of the Geraghty & Miller data for almost two years.